

Ehrlichiosis
A Silent and Deadly Killer
By
Jan Hendrick, Border Terrier Breeder
Bob Wilson, Border Terrier Owner

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Foreword
Dr. Ibulaimu Kakoma DVM PhD

First I want to thank Jan and Bob for giving me the opportunity to make some remarks and to congratulate them for undertaking such heavy and well executed responsibility to address this important issue. Their basic premise was to reach the owner/breeder and also to establish dialogue with the veterinary clinicians and scientists outside the vet's office. I think they have achieved both. The owners and breeders will gather tremendous information from this article in a language they will understand since there is a minimum of technical jargon to cloud their reading enthusiasm. The veterinarian and scientist will get the challenging message that the 21st century clients have modern tools to watch everything we do and publish and they are looking for a practical product for their pet....at times regardless of how much it will cost. The clients are also prepared to work with us to the extent possible and when they question our training they are not vet-bashing but trying to develop a dialogue.

The authors are right in indicating that diseases have no borders. Today the definition of a tropical disease could not have been more nebulous and blurred! That is why we have task forces in USA and Europe to deal with "Emerging diseases" which show up suddenly and unexpectedly. In some ways ehrlichiosis meets that definition.

This raises the issue of training in tropical medicine. The authors' point is well taken that veterinary curricula are facing the challenge to accommodate the problems of newly emerging diseases, such as ehrlichiosis.

Extra attention needs to be paid to this segment if future veterinarians are going to be prepared for diseases that just emerge here or encountered in missions overseas. It is gratifying to know that there is a Society of Tropical Veterinary Medicine and "Intervet" which expose our veterinary community to so-called foreign diseases. The USDA at Plum Island along with the CDC are

examples of establishments that have enormous resources to educate all of us on these issues.

Bob and Jan bring up the issue of the complexity of ehrlichiosis. In fact the disease is more of a syndrome. Readers will appreciate this from articles such as that written by David Huxsoll who has so neatly categorised the stages of the disease. The spectrum of syndromes and disease entities imitated by ehrlichiosis are incredible, emphasizing the need to carefully rule out ehrlichiosis for common infectious diseases.

The warning signs may certainly be subtle. Can one rule out ehrlichiosis by the IFA test and should we treat all animals which are IFA positive? First, a positive IFA test simply means "current or previous exposure"treatment or recovery does not guarantee a negative IFA.

Any patient positive in the IFA and presenting with signs consistent with ehrlichiosis should definitely be treated. Indeed empirical treatment is reasonable if in the clinician's assessment waiting for the IFA results could endanger the patient. IFA could certainly be negative during the very early phase of the disease even when severe signs are evident.

Therefore, in the writer's opinion a clinical assessment may supercede the IFA status. A positive IFA test excludes a dog from being a blood donor and membership of a breeding stock for the fear of transmitting the disease and every effort should be made to research into methods of terminating the carrier state.

Provided the treatment is prescribed and monitored by a veterinarian, it seems less risky to treat IFA positive animals resident in a non-endemic area than to risk a severe disease. In an endemic area, however, treatment on the basis of the IFA test per se cannot be justified since the patient will again be exposed and the synergistic advantage between antibodies and the cellular immune system may be of value in fighting the new infection. In other words, in areas where the diseases are common practically every dog has been exposed and treatment can only be justified on the basis of the clinical disease.

The relatively low endemicity in many parts of North America means that supervised treatment of early diagnosed (by IFA or PCR) cases is worthwhile to prevent costly potential worsening of the patient's condition or even death, as mentioned by Bob and Jan. They have shared with us their private experiences in which intervention helped some cases and when the problem was recognized too late the patient could not be saved. It must be emphasized, however that empirical treatment with antibiotics must be carefully evaluated and monitored to avoid abuse of these important compounds.

The other issue raised is "early diagnosis". The PCR test is showing promise and perhaps in future it will be available routinely. Because the test is DNA-based, it offers the most specific and sensitive detection method which confirms that the patient is definitely infected and treatment would be indicated without any doubt. Finally, we must join the authors in a crusade to find alternative drugs to doxycycline and tetracycline in case we encounter resistance to these drugs or we are treating mixed infections (e.g. ehrlichiosis and babesiosis). A case in point is Imizol a well tested drug used in many parts of the world but not legally available for dog treatment in USA. Compassionate users of Imizol have reported impressive results in cats and dogs suffering from ehrlichiosis and we should continue research to facilitate approval by the FDA. The ultimate goal should however be the development of a vaccine for this disease complex and

for that we need to work with the breeder, the owner, industry and academia. This mission is noble according to the wishes of friends such as Pajti, Jake, Bear, Saucy and many others born in the Hendricks and Mair families.

For those searching for additional reading please search under the following scientists: Ewing, S; Huxsoll, D; Breschwerdt, E; Dawson, J; Lewis, G E; Holland, C J; Ristic, M R; Dutta; Rikihisa, Y; Madigan, J; Dumler; Bakken; Nyindo; Roulit; Long, M; Goetz; Palmer, G; Walker, D; and many other scientists.

Ibulaimu Kakoma, DVM PHD
Urbana IL.
January, 1996

PURPOSE

The purpose of this document is to help dog owners as well as their veterinarians become aware and learn more about a dreaded and deadly killer that is claiming the lives of dogs in all 50 states.

We also encourage you to reproduce the document should you wish to pass it on to others. We only ask that it be the complete document so that nothing is taken out of context and to give credit to those who labored so diligently in its preparation.

While a lot of detail is contained in this document, it is thought and hoped that it will be shared with the dog owners' veterinarian. Many vets are not familiar with ehrlichiosis, do not appreciate the magnitude of the problem or have treated it as something else failing to treat the underlying cause. This is in no way meant to condemn the veterinary community. As you will see, they are reacting to what they perceive as signs of diseases they are more familiar with, which is a very logical approach but not one that will work with ehrlichiosis. The nature of this disease is such that it mimics a great many other diseases, and this tends to confuse and complicate treatment.

There are many forms of the disease attributed to the organisms in the genus ehrlichia that are genetically related, including one of the species recently found in humans which causes the disease HGE (Human Granulocytic Ehrlichiosis). Another is E. equi species which causes illness in horses. This is a different species than E. risticii which causes Potomac Horse Fever and is also found in dogs. Other identified species are E. sennetsu, human pathogen, E. ewingii and E. platys, both canine pathogens. The species E. ewingii has been reported in dogs in Minnesota, and likely occurs in other states as well.

The two keys to success are early recognition and treatment.

Treatment with proper antibiotics can be quite dramatic in these cases, whereas treating an ehrlichiosis patient with steroids or drugs other than the tetracycline family will almost certainly lead to tragedy.

THE TRIP TO THE VET

This section is for the clinician. Please form a picture in your mind of the following: A client comes into your clinic with her dog. She is a good client, her dog gets his vaccinations regularly, is on heartworm preventive, and is obviously well cared for.

But today it is apparent she is very worried about her pet. You glance at the dog - a middle-aged pleasant animal who looks a bit tired. "Doctor", the owner begins, "He just isn't himself lately - he doesn't want to play anymore, and he always enjoyed retrieving his ball. His coat isn't as nice as usual - he seems to be turning gray early - he's only 5 years old! We've noticed his breath is really bad, and sometimes he doesn't want to eat. Then he will eat fine for a few days, but he will throw up yellow stuff. His eyes are really red too - and sometimes they have a glassy reflective look like they do at night in a headlight. He used to love to sleep with us, but now he seems to have trouble getting up on the bed. And he's always drinking water - I don't remember him ever drinking so much water. And I've never known him to have so many accidents; he always used to be so clean - now sometimes he doesn't even ask to go out - he just goes on the floor like he doesn't care. What could be wrong with him Doctor? I'm really worried...."

O.K. Doctor, what do you think? Impossible for one dog to have so many problems? Neurotic owner? Better take a look.....with the dog up on the table, you take his temp - normal. Eyes are pretty red - allergies? Coat does look a bit dull, but you've seen worse. You ask about the food he is eating - how much exercise he is getting - has his routine changed lately?

Chances are good that this dog may be sent home with different food, vitamins or a coat additive, advice to cut back on the evening water so there won't be so many accidents. Maybe he is just bored and needs more attention. Still, it wouldn't be a bad idea to do a CBC. What about his difficulty in getting up on the bed - could he be developing arthritis? Seems kind of young - but maybe he's just getting old before his time. Then the CBC comes back within normal limits - white count is a little depressed, but not that bad. He seemed to have a slight cough - could be a mild case of kennel cough that he just can't shake. Amoxicillin for a couple of weeks should take care of that.

Sound familiar? This is beginning to happen in veterinary clinics all over America every day. Because the signs are run-of-the-mill, it is not the sort of case that even the most detailed veterinarian is going to get too excited about. We would like to change that, because there is a very good chance that the dog just described is suffering from a type of infection often considered as rare - ehrlichiosis. The fact is, ehrlichiosis is not rare at all, and through this paper, we hope to dispel that myth - because that myth is resulting in countless deaths of pet dogs and even cats - and each and every one of these pets was someone's special friend. It doesn't have to be that way.

Perhaps the most critical thing for the clinician to remember is to look at the big picture. Does a client's pet really have several ailments affecting different systems, or could it be suffering from ehrlichiosis which in essence, affects all systems?

What about the purebred show dog with autoimmune disease? It is easy to assume this is a genetic problem inherent in the breed but why not give the dog the benefit of the doubt and consider ehrlichiosis as a possible cause. Response to treatment with proper antibiotics can be quite dramatic in these cases, whereas treating an ehrlichiosis patient with steroids is almost certainly signing its death warrant.

Today's veterinarian will also acknowledge that today's pets travel far and wide with their owners. As a result, the diseases and vectors are no longer limited to specific regions. Ticks thrive in cold as well as warm climates and where the tick goes, so goes the ehrlichiosis.

EHRLICHIA - WHAT IS IT?

Surprisingly, Ehrlichia has been around for a lot longer than most people realize. It was first described in 1935 in Algerian dogs. However, in 1962, a number of military dogs (German Shepherds) that had been stationed in Vietnam died from complications of Hemorrhagic Fever. It was later determined to have been caused by the ehrlichia species *E. canis*.

Even more surprising is that the rapid spread and reports of the disease have only occurred in the last few years. Today it has been and continues to be reported in all 50 states, Canada, Europe, Asia, South America and Africa.

Ehrlichiosis is related to Rocky Mountain Spotted Fever and shares similar signs, though rarely does a victim of ehrlichiosis display the rash that is associated with RMSF. Lyme disease also shares some of the same signs, but technically is in a separate category. Lyme disease is caused by a spirochete (a spiral shaped bacteria) and although it is transmitted by ticks, as are most of the rickettsias, Lyme disease is sensitive to a wider range of antibiotics, and Lyme disease has never been linked to fatalities as are many of the rickettsias. The rickettsial group is unique in that it's members share some traits of a virus, and some traits of a bacteria, but they are classified with bacteria.

While doxycycline is frequently used to treat Lyme disease, other drugs have been used. Amoxicillin is a recent trend in the treatment of Lyme disease but has no effect whatsoever on ehrlichiosis. As both and ehrlichiosis share some signs a misdiagnosis of ehrlichia as Lyme disease could prove fatal to both dogs and humans if not treated with the proper drug.

Rickettsias actually parasitize the white blood cells, which is why they are so devastating to their victims. Essentially, they cripple the immune system by inhibiting the basic function of the bone marrow - that of making new cells to replace old and dying cells.

Once a human or animal is stricken with ehrlichiosis, white cells die off faster than the bone marrow can replace them. These dead cells migrate primarily to the spleen which enlarges as a result. Frantically, the bone marrow works to form new, healthy cells. In its haste, it sends out immature cells which do not work efficiently. Quite often these immature cells are almost indistinguishable from those seen in leukemic patients. Advanced Ehrlichiosis is, in fact, often misdiagnosed as leukemia or lymphosarcoma.

To complicate things further, ongoing research suggests that chronic ehrlichiosis may lead to various cancers, especially leukemia and lymphosarcoma. There is speculation that it may predispose animals to other forms of cancer as well. Because of its effect on the nervous system, ehrlichiosis is also sometimes misdiagnosed as brain cancer. It does, in fact, affect many dogs neurologically and can cause seizures, problems with coordination, changes in temperament, or obsessive-compulsive behavior (such as repeated licking or other repetitive behaviors.)

Causes of death by ehrlichia are usually due to internal hemorrhage including hemorrhage into the brain, severe autoimmune disease, multiple secondary infections due to a compromised immune system or complete failure of one or more internal organs such as heart, liver, spleen, etc.

HOW IS IT TRANSMITTED?

With the exception of *E. risticii*, most rickettsias are believed to be spread through contact with ticks. *E. risticii* is particularly difficult as no vector (the insect agent of transmission) has been clearly identified. Ongoing research indicates that a tick could be implicated but a variety of possible vectors exist. Flies, mosquitoes, chiggers, and fleas, are all being considered as possible insect vectors.

Carriers (reservoirs) of the disease may include mice, rats and other mammals who have constant exposure to various insects (but are themselves unaffected by the disease). It was once thought that cats and even dogs could act as reservoirs for *E. risticii* and not develop signs of disease. In the last few years this has not proven to be consistent as more and more domestic dogs and cats have developed serious illness after natural infection with *E. risticii*.

Newly infected domestic animals (who may ultimately succumb to the disease) may serve as carriers for insect vectors, who then pass the infection to another animal. At least one of the species, *E. risticii*, can be passed through the placenta to puppies. It can also be passed from infected donor animals used in veterinary clinics. None of the species are thought to be passed through breeding, but we have been unable to locate any current research in this area.

The two species that have, to date, been most commonly reported in dogs are *E. canis* and *E. risticii*. It is possible to be infected with both species which presents a particularly nasty challenge. It is fortunate that both respond to the same method of treatment. There is no breed that has shown either a greater or lesser immunity to the disease and there are a great variety of breeds, including mixed breeds, that have contracted ehrlichiosis.

While it was initially found primarily in the Southwestern States, today it is found throughout the US. The human form has had the highest number of reported cases in Wisconsin and Minnesota but it too is found in many other locations in the US.

It should also be noted that it has been fatal in humans whereas Lyme disease has yet to claim its first victim.

THE STAGES OF EHRLICHIOSIS

The disease typically courses through three stages. The first is the early or acute stage (which usually mimics a mild viral infection.) The signs in this stage may be very subtle and could go unnoticed. Without proper treatment the animal will go on to a subclinical (second) stage or may advance to the chronic (final) stage. During the acute stage most, if not all, damage is reversible and a full recovery is possible. It is during this stage that treatment is most effective, which emphasizes the need for early detection.

Once the chronic stage is reached, the rickettsial organism has taken up residence within the bone marrow. At this point the damage done is often irreversible. It is not unusual for dogs in this final stage to suffer massive internal hemorrhage, or succumb to sudden stroke, heart attack, renal failure, splenic rupture or liver failure, resulting in death. A peculiarity about the disease is - these dogs often do not look or act as though they are in a terminal stage of disease until their final hour.

DETECTION OF EHRLICHIA

If there is any one element of this disease that makes it especially deadly, it is the ability it possesses to mimic other diseases. Perhaps the best description of ehrlichiosis is "the AIDS of the canine world". The detection of the disease has, so far, only been successfully accomplished through IFA (indirect fluorescent antibody test) which detects the presence of antibodies. This test is, however, not infallible; dogs sometimes test negative in the acute phase due to their immune system's delay in forming antibodies. They may also test negative, or with a low titer, when in the chronic stage (the immune system at this point may be giving up the battle.)

Regardless of the what the titer is, any positive should be considered indicative of infection and treated quickly and aggressively. A dog with a negative titer who has signs should still be treated, then re-tested at a later date.

Although *E. canis* and *E. risticii* appear to be the most common species to infect dogs, other species are out there which won't be detected if the laboratory is testing strictly for *E. canis* or *E. risticii*. (Another reason to treat the signs even if the titer test is negative.) CBC panels have been used but they are too non specific to be reliable. There are many cases where a dog's CBC has been "within normal limits" yet the dog died of ehrlichiosis! CBC Panel abnormalities are often so borderline, they may be overlooked by the vet as inconsequential. An example could be a dog who appears to have sufficient platelets, yet is showing signs of internal hemorrhage (blood in urine, bruising on mucosal surfaces, coughing, bloodshot eyes etc.) This can happen because the platelets have lost their ability to function normally - they can actually lose their adhesiveness which hinders their ability to form a normal blood clot.

When abnormalities are seen in a CBC Panel, they may include a reduction in platelets, mild anemia, high WBC (usually in new infections), low WBC (usually in chronic cases), high sedimentation rate (due to dead cells outnumbering healthy cells), high alkaline/phosphatase ratio, and other slight abnormalities. Kidney function tests may show high BUN and creatinine. In these cases, the diet should be altered to lessen the strain on the kidneys.

The following laboratories are experienced in running the IFA test for various species of ehrlichia, including *E. risticii*. In some laboratories discounts may be available, either when testing for several species of ehrlichial infection in the same dog (a "rickettsial panel") or if multiple dogs (such as in a breeding kennel) are tested at the same time ("bulk testing"). Be sure to inquire about any discounts before blood is sent.

Blood must be spun down to separate the serum component which is then shipped via overnight mail in a cold pack. Direct any questions about this procedure to the laboratory where you are sending the sample.

Labs
University of Illinois
Laboratory of Veterinary Diagnostic Medicine
ATTN: Dr. Kakoma
P.O. Box "U", 2001 S. Lincoln
Urbana, IL 61801
PH: 217/333-1620 or 217/333-1859
FAX: 217-222-4628

Protatek Reference Laboratories
ATTN: Dr. Cynthia Holland
574 E. Alamo Street
Chandler, AZ 85225
PH: 602/545-8499

Dr. T. McElwain
Washington State University
Vet Diagnostic Lab
Pullman, WA 99164

Dr. E.B. Brietschwerdt
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North Carolina State University
College of Vet Medicine
4700 Hillsborough Rd
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SIGNS OF THE DISEASE

Perhaps the greatest challenge in battling ehrlichiosis is in detecting and accurately assessing the signs. This has been one of the major reasons for the disease being under-reported and misdiagnosed. In most cases the early signs are very subtle. In all cases the signs mimic those caused by other diseases.

In the acute phase of infection, ehrlichiosis appears much the same as any viral infection. The animal often runs a fever, may lose his appetite and/or act depressed, the eyes may have a glassy appearance, etc. These signs may even disappear of their own accord in a few days time. Animals who are especially stoic may pass through this phase without anyone even noticing. This stage of the disease almost always clears up without treatment. It is, however, during this stage that treatment can be most effective in eliminating the disease.

Virtually any unusual sign is worthy of note as there are generally more than one. The animal may act depressed or tired with a diminished interest in playing. Acute infections of *E. risticii* will sometimes involve diarrhea and/or vomiting (often this is vomiting of bile only). The animal usually refuses food for a few days, may lose weight, and will probably want to be left alone. *E. risticii* is often misdiagnosed as parvo or corona infection, and occasionally the signs of

E. risticii are very similar to those of kennel cough.

It is when ehrlichiosis is not treated in this first stage with the proper antibiotics that it goes on to wreak havoc in the system of its canine victim. The following list of signs should be carefully reviewed as recognition of the signs will more than likely be the first indication of the disease. Remember that while few dogs display all of the signs, most will show several. Again, stoic dogs are the most difficult to diagnose; trust your instincts and remember that you are the best judge of what is normal in your own dog and what isn't.

In one case of a Border Terrier who had both E. canis and E. risticii, the only sign noticed by the owner was the dog lost interest in play - something he had always enjoyed to the utmost. As we have indicated, any change in behavior is enough to warrant precautionary measures.

Breeders may observe unique signs due to their experience with pregnant and nursing bitches as well as puppies. A female dog with signs previously too subtle to be noticed, may develop serious illness during pregnancy, or she may deliver dead or ailing puppies. In these cases, breeder and veterinarian must work in cooperation with one another in order to make the correct diagnosis.

We would like to thank and are eternally grateful to Susan Netboy for the excellent job she has done in compiling the following list. Susan is very active in greyhound rescue and was one of the first to realize the scope of ehrlichiosis as well as babesiosis in rescued greyhounds. It should be of concern to all that greyhounds make up a very large percentage of the blood donor dogs, both at university veterinary school hospitals, and at many veterinary clinics. Rickettsias are readily spread through blood transfusion.

Information gathered by Susan Netboy:

EHRILCHIOSIS is an infectious blood disease. A reduction in cellular blood elements is the primary characteristic of the disease. Although the organism lives and reproduces in the white blood cells (leukocytes); it has a particularly devastating effect on the lymphatic system and will ultimately affect multiple organs, systems, and cells: respiratory, circulatory, central nervous system, kidney, brain, liver, spleen, endothelium.

Additionally, the severe depression of the immune system created by the disease opens the door to secondary bacterial infections and other complications. Because the onset of visible signs is likely to be gradual in the chronic phase and subtle in appearance, alertness to the following conditions is imperative in order to catch the disease while it is still treatable:

- 1 weakness
cough
labored breathing
fatigue
pneumonia
intermittent fever
arthritis
muscle wasting
discharge from nose or eye
depression
weight loss
anorexia
increased thirst and urination
incontinence
sensitivity of the skin
head tremors
disorientation
seizures
neck or back pain
bleeding tendencies
pallor due to anemia
retinal hemorrhages

bleeding into the skin
rash
nose bleeds
spontaneous bleeding
abdominal tenderness
swelling of the legs
swollen lymph nodes

Certain features of ehrlichiosis may mimic the following diseases:

- 1 systemic lupus erythematosus
- 2 brucellosis
- 3 blastomycosis
- 4 endocarditis
- 5 immune mediated diseases
- 6 thrombocytopenia
- 7 pancytopenia
- 8 myelophthisis
- 9 cancer of the spleen or liver
- 10 Valley Fever
- 11 plasma cell myeloma
- 12 leukemia

It is recommended that ehrlichiosis be ruled out before accepting these diagnoses as a definitive cause of the illness or condition. Ehrlichiosis is known to be prevalent in racing greyhounds; there is no question amongst veterinarians who have dealt with the disease that it must be taken seriously and aggressively treated. Testing is simple and definitive; a positive titer at any level needs to be treated. Very good results can be obtained with readily available, inexpensive treatment of a 7 to 8 week course of tetracycline or doxycycline at the correct dosage.

(For further information contact: Susan Netboy at (415) 851-7812) Contents
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TREATMENT OF EHRLICHIOSIS

Due to the rapid spread and inadequate publicity the single biggest failure has been the failure to recognize and test for the disease. Perhaps the strongest recommendation that can be made is to eliminate ehrlichiosis first as a possible cause by treating with appropriate antibiotics to see if the animal responds. If an animal has any of the above signs an excellent path would be to take blood for a Indirect Fluorescent Antibody (IFA) test and start the animal on doxycycline immediately.

If the titers return as negative, but the animal is responding to treatment, he should be kept on the antibiotic and re-tested in a couple of weeks. The IFA test looks for the presence of antibodies produced by the dog's immune system and it may take as long as 30 - 45 days for the immune system to respond with the production of enough antibodies to detect. As doxycycline does not affect the production of antibodies it will not interfere with the test results.

We strongly advise against waiting for a positive result before treating with doxycycline. Vets should also be cautioned about the use of steroids in a dog

who may have ehrlichiosis. If Lyme disease is the suspect then treat with doxycycline. Although some chronically-infected dogs may need steroid treatment, this should always be done in conjunction with doxycycline treatment and only as a last resort measure. In cases where the vet feels more than one disease may be involved, ehrlichiosis should be given the first priority.

In acute cases there is usually a dramatic response to treatment. A case in point involved a Border Terrier owned by one of the authors. He presented with signs consistent with renal failure, and renal failure is not usually treated with doxycycline. However, the owner was aware that the dog had been exposed, and the signs had come on quite suddenly. There was also apparent (though slight) enlargement of the spleen and liver. The vet then reluctantly agreed to treat with doxycycline along with other supportive therapy.

When the test results came back 48 hours later, the vet was alarmed at the apparent indication of chronic renal failure. However, re-examination and testing of the patient showed dramatic improvement - 2 days on doxycycline had brought kidney function back within the normal range, the heart rate had returned to normal, and dehydration was no longer evident. Subsequent IFA titer tests showed the dog was indeed positive for both *E. canis* and *E. risticii*. Due to the decision to treat immediately, this dog is still alive, enjoys excellent health, and has normal kidney function at age 7 1/2 years. This also makes the drug a diagnostic tool as well as treatment. If the signs disappear with treatment it is almost a virtual certainty that the dog has been infected and blood tests should be run to make the confirmation.

Most cases have shown a good response to treatment with the tetracycline family of antibiotics. Doxycycline is the preferred drug as it has less potential side effects and better penetration of certain bacteria (Merck).

Inoculations as well as injectable antibiotics should not be administered to a dog suspect for ehrlichial infection, as reactions have been reported, some of which proved fatal to the patient (the immune system is already taxed due to the action of the disease.)

Another drug, Imizol, has also proven very effective, but unfortunately it is not readily available in the US and is still considered experimental.

The suggested treatment with doxycycline has been 5 to 10mg per day per Kg. (according to the Merck Manual.) Some dogs have been treated at a rate of 20 mg per kg body weight per day (or 200 mg for the typical 22 pound dog, divided into two daily doses given 12 hours apart) with excellent results. Most cases have shown that the higher dosage is more effective, but its use will be dictated by the animals tolerance. It should be administered for at least a 6 week period. Due to the high dosage Merck also suggests vitamin supplementation with vitamins B and K due to the reduction in the animals ability to synthesize those vitamins in the large intestine. In some cases

wrapping the tablet in a piece of bread or adding to rice will facilitate administering the drug as well as helping to prevent nausea which may occur in some animals on the high dosage.

CONCLUSION

We hope that this will be a help in spotting the signs and treating ehrlichiosis early and effectively. More importantly, we hope that it will create an awareness in owners, breeders and veterinarians to watch for the subtle signs of this disease. If caught early it is curable.

For those who read this and can influence pharmaceutical companies to develop a vaccine as has been done for Lyme disease, we will consider our mission complete.

Questions regarding this article may be directed to the authors:

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We thank the many veterinarians, veterinary technicians, breeders and owners who have shown genuine concern for the animals suffering from ehrlichiosis, and share our determination to push for more widespread testing, treatment, and hopefully a vaccine. We would also like to make a special mention and thanks to Michelle Tjaden who, in addition to providing a great deal of research information, had the first dog (Border Terrier) from which the first culture of *E. risticii* was grown by Dr. Kakoma. We would also like to thank Barbara Mair who has also researched this disease with a vengeance and was instrumental in getting DNA testing underway.

A very special thanks has to go to Dr. Ibulaimu Kakoma who is an Associate Professor of Microbiology/Immunology at the College of Veterinary Medicine at the University of Illinois Champaign. Dr. Kakoma is a Doctor of Veterinary Medicine as well as a microbiologist and is an expert on the subject of tick borne diseases. He has written many articles on the subject of ehrlichiosis and continues his research today. He took many hours out of his busy schedule to discuss various issues and agreed to write the Foreword at the beginning of this article. Dr. Kakoma is fully dedicated to the eradication of ehrlichiosis and has been instrumental in providing technical assistance, not only for this document, but to our mutual attempts to attract and convince drug manufacturers to develop a vaccine.

WE DEDICATE this paper to our memories of Saucy, Jake, Bonnie, Clancey, Duke, Keeley, Pajti, Emma, Penny and the many many other beloved pets who lost their battle with ehrlichiosis, and left an empty spot in the hearts of their owners that can never be filled. All of these dogs succumbed to an insidious killer we now know as ehrlichiosis because, at the time, there was not enough widespread knowledge to prevent it. We created this paper to provide that

knowledge to help prevent others from the same fate and dedicate this paper to those stoic little animals so they will not have died in vain.

POSTSCRIPT

by

Bob Wilson - Border Terrier Owner

In the process of putting this document together I was asked by several people around me as to why I seemed so focused on the subject. Many who have experienced this type of tragedy would prefer to move on and try to forget the incident. My answer was that I guess that I preferred to learn from history rather than be doomed to repeat it.

There is no question that it is a valid answer but the real reason was that you had to know Jake. She came into my life at a time when turmoil was the norm and I was finding myself emotionally drained. While Jake's arrival five and a half years ago didn't solve the problem it made my life bearable and gave it a purpose. I found myself changing my lifestyle to adapt to hers. We were constant companions and virtually inseparable. Jake went to the office with me, spent countless hours in the car with me and slept with me. It was almost a joke amongst many of my friends as they knew that if they invited me somewhere where there was any possibility of bringing Jake that she had to have an invitation or I might not show. She gave me more love than I knew existed and in return I gave her more love than I knew I had. She read me like a book and knew when I needed a friend and when I needed to go play ball with her. She was my best buddy.

On October 30, 1995 that relationship came to an abrupt and sad end with her death from what we now know as ehrlichiosis. It was only 30 days prior to her death that I learned about this insidious killer and by then it was too late. If life was 36" in diameter I had just had a 34" hole blown in mine. There has never been the death of any living thing that has so profoundly affected me. It is a loss that still haunts me to the depth of my soul.

Because there seemed to be no clear-cut reason for the disease I went on a quest to learn all I could about it. Unquestionably Jan Hendricks, a co-author of this document, was my major source of both information and consolation. Jan is a Border Terrier breeder and was where Jake came from. Her dedication to the breed and maintaining its' high standards is nothing short of awesome. It was through our discussions that we decided to try to put all of the known information in one place. This document very simply would not be if it were not for her dedication.

There are many others who provided information to this document that space does not allow us to mention. Several, however, simply have to be recognized. Susan Netboy who is involved with Greyhound Friends for Life which is a rescue organization has done a great deal of work in "spreading the word". A significant part of her work on ehrlichiosis is contained in this article. A very special thanks to Lynda Adame who runs the "Tick Net" on the Internet. That group now has over 55 members who regularly share information on ehrlichiosis and babeiosis and it's treatment.

We hope that this document will help you avoid the pain, sorrow and problems that we have all experienced with this silent and insidious killer.

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